K20 Plus/S
Character Generator
Instruction and Technical Manual
(also covers K12 and K20 versions)

KNOX

VIDEO PRODUCTS

8547 Grovemont Circle
Gaithersburg, MD 20877 USA

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SECTION 1. GENERAL INFORMATION

1.1 INTRODUCTION

The K20 PLUS/S is an eight-color NTSC high resolution character generator designed for titling, slating, credit rolls, in live broadcast, post-production tape editing, or stand-alone message applications. The K12 is a monochrome version of the K20. The K20 PLUS/S is compatible with Y/C systems as well.

1.2 TECHNICAL DESCRIPTION

The K20's electronics are contained on a single card contained within the keyboard housing. A separate external power unit supplies D.C. power to the electronics.

The K20 PLUS/S acts as an independent video generator with an input which allows it to synchronize with external video if desired. A video mixer synchronizes the K20 PLUS/S to externally generated picture video and keys crisp titles and color fields over incoming video or color background. A full-color preview output displays the current character text over a black background.

A second section provides the microprocessor components, memory, and character generator logic necessary to create the displays. All controls are generated by keystrokes on the keyboard.

The K20 PLUS/S consists of the keyboard housing and a separate power pack.

1.3 DETAIL SPECIFICATIONS

1.3.1 VIDEO SPECIFICATIONS

Video Input: 1	Composite picture video or black burst, RS170, NTSC or PAL standard (input optional - not required), terminated in 75 ohms

Video Input: 2	Y/C picture video (K20 PLUS/S only)
Preview Output:	Composite color video signal with K20 PLUS/S program display showing cursor; K12 is monochrome
Program Output:	full color NTSC or PAL (or Y/C if K20 PLUS/S) signal with K20 PLUS/S character display over input video
Connectors-Video:	Three UG657/U BNC female Two 4 pin mini-DIN (K20 PLUS/S only)

1.3.2 DISPLAY FORMAT

Font Memory:	16K bytes
Font Configuration:	Two fonts standard, Helvetica 32 lines, upper and lower case, and Eurobold 32 line upper case
Font Matrix:	32 scan lines x 32 dots maximum
Horizontal Resolution:	60 nsec (average)
Character Line:	32 characters maximum
Line Height:	48 scan lines
Lines per page:	8 (9 for PAL)
Page Memory:	17 pages, expandable to 65, with battery backup, 2-8K x 8 memories (8000 characters) per block

Memory Bits:	16: 7 bits ASCII, 1 bit font, 5 bits foreground color, 1 bit flash, 1 bit cursor
Battery:	Duracell DL2032, 3 volts, or equivalent
Title Window:	1 line title at top, center, or bottom of page
Keyboard:	integral 84 key keyboard, 8 bits serial ASCII at 9600 baud
Colors: K20 PLUS/S-	8 colors:

0 transparent	1 white
2 black	3 yellow
4 red	5 magenta
6 blue	7 green
8 brown	

K12-	0 transparent	1 white
	2 black	

SECTION 2. INSTALLATION

2.1 INTRODUCTION

This section provides the information required for installation of the K20 PLUS/S into its operating environment.

.....CAUTION.....

The K20 PLUS/S is designed to work with standard power systems of 105-240 VAC, 50/60 Hz, and standard television systems. Operation in other environments may harm the K20 PLUS/S or associated equipment. Consult identification plate on K20 PLUS/S power-pack for specified voltage.

2.2 UNPACKING AND INSPECTION

Unpack the K20 PLUS/S keyboard unit and the power pack carefully and verify that the serial number plates match the numbers quoted on the packing list. Before applying power, check unit carefully for signs of damage, and tilt unit back and forth to be certain no hardware has come loose inside.

Units are shipped with a Duracell DL2032 or equivalent battery for the memory backup system. This cell should be changed every year, or earlier if memory contents seem to be lost or changed after power up. See *Section 4: Maintenance* for details on how to change the battery.

2.3 CONNECTIONS AND INITIAL CHECKOUT

Connect the DIN plug from the power pack to the K20 PLUS/S's rear panel connector, being careful to note the key on the DIN plug. Connect the power cord to a grounded 105-240 VAC source. Connect a monitor to the Preview Output BNC connector, and a color monitor to the Program Output BNC or mini-DIN connector. The toggle switch on power unit turns main power on.

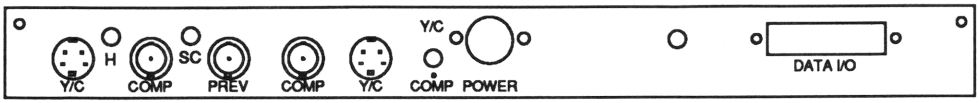


Figure 2.1: Rear Panel

The Preview display should read:

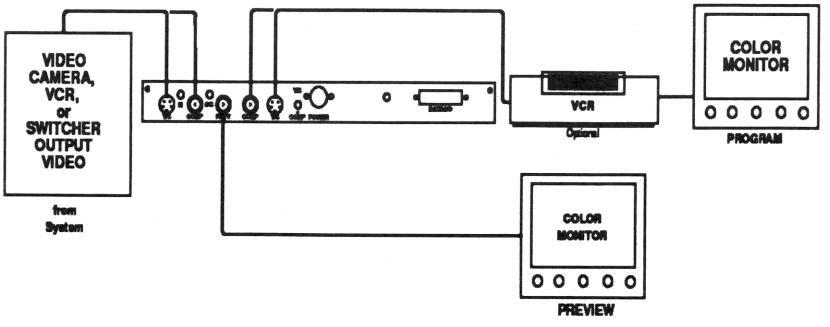
abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ
1234567890 !@#$%&'()"
COLOR TEST

This is page Zero. Push GO,
a page number, and RETURN.

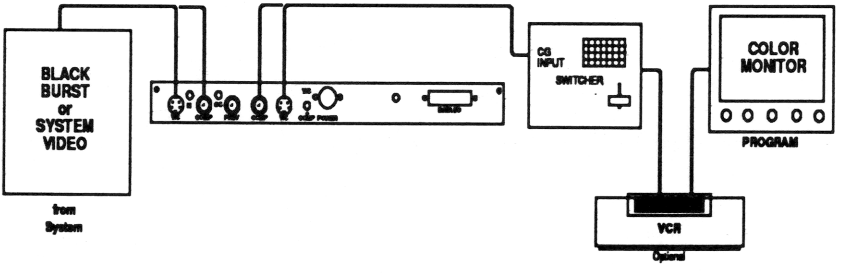
Figure 2.2: Preview Display

2.4 INSTALLATION INTO SYSTEM

Connect the K20 PLUS/S in one of three ways: (See Figure 2.3)



STANDALONE OR DOWNSTREAM



UPSTREAM

*** Set Switch to correct position, Y/C or Composite**

NOTE: Preview output is monochrome if Y/C mode selected

Figure 2.3

STANDALONE. In this configuration, the K20 PLUS/S is generating the entire picture (there is no other video background). A black burst input is optional for extra stability.

DOWNSTREAM. The K20 PLUS/S displays are keyed over incoming video from a VCR or camera. Wherever the TRANSPARENT color is used on the K20 PLUS/S display, incoming video or color black will show through. Connect incoming video to the appropriate Input Video connector (NTSC or Y/C).

UPSTREAM. The K20 PLUS/S displays are sent to a switcher to be mixed with video. Black burst or system video is required at the appropriate video input jack. Connect the program output to the switcher input.

2.5 TIMING THE SYSTEM

Horizontal and subcarrier phasing controls are mounted on the K20 PLUS/S's video subassembly facing the rear of the unit with access for adjustment of H and SC on the BNC panel at right rear. Use a small slotted tuning tool or screwdriver. The controls are 20-turn potentiometers with no stops at the ends. Adjust them as required for the system configuration chosen:

STANDALONE. No timing adjustments are required since sync and subcarrier are generated by the K20 PLUS/S in this configuration. Note: H and SC have no fixed relationship to each other in standalone mode, so there will be herringbone effect on NTSC color transitions. To avoid this, connect a source of color video or black burst to the video input.

DOWNSTREAM. The K20 PLUS/S will lock to incoming video from a wide variety of sources. To phase the system, connect a standard signal (preferrably color bars) to the appropriate input video. If either sync or color are not locking, consult Section 4.4. Toggle PROGRAM OFF so that the input signal is shown on PROGRAM video out. If instruments are

available, connect PROGRAM video out through a waveform monitor and vectorscope. First adjust the H control so that the picture is centered (or adjust for alignment of horizontal blanking on the waveform monitor). Then adjust the SC control so that the colors are right (or so that the vectors are properly aligned on the vectorscope). Any variations in amplitude of the luminance or chrominance shown by the instruments can be adjusted by inside controls. Consult Section 4.4.

UPSTREAM. Supply a source of video or black burst locked to the system switcher to the K20 PLUS/S video input. Connect the PROGRAM output to one of the switcher's video bus inputs. Select the K20 PLUS/S bus, without effects. Using the K20 PLUS/S color editor, set the background color to yellow. If instruments are available, connect a waveform monitor and vectorscope as well as a color monitor to both the PROGRAM output of the K20 PLUS/S and the VIDEO OUT of the switcher. First adjust H to center the display on the switcher output (or align horizontal blanking on the waveform monitor). Then, using the vectorscope if possible, adjust SC to set the switcher output color to agree with the K20 PLUS/S PROGRAM output. The SC control provides about 180° of timing; if more delay is necessary, use cable or delay lines between the switcher and the K20 PLUS/S's video input, or

SECTION 3. OPERATION

3.1 INTRODUCTION

This section explains the operation of the K20 PLUS/S in a video teleproduction environment in detail. Most of the K20 PLUS/S's operating instructions are printed on its front panel - this section is designed to supplement the front panel instructions.

3.2 CONNECTIONS AND TIMING

Consult sections 2.4 and 2.5, figure 2.3 to connect the K20 PLUS/S into your system. Operating the K20 PLUS/S is the same for all configurations. In the absence of an input signal the K20 PLUS/S will insert color black instead of picture in TRANSPARENT areas.

3.3 HOW TO TURN THE POWER ON

Connect the K20 PLUS/S power pack to the K20 PLUS/S keyboard unit. Connect the power pack to a source of ac voltage which matches the rating given on the identification plate of the power pack.

The main power switch for the K20 PLUS/S is on the external power pack supplied with the K20 PLUS/S. The power pack should not be un-plugged from the K20 PLUS/S while its power switch is ON - the red indicator light will flash a warning if the power pack is not connected to the K20 PLUS/S.

Turn the power pack on. The CAPS LOCK and NUM LOCK lights on the keyboard should come on briefly and then go out. The red LED indicator on the power pack should be on.

3.4 HOW TO START

The K20 PLUS/S has 16 pages of battery-saved memory (or 64 with the optional extra memory) and 1 page (page 0) of memory which is cleared each time power is removed. The K20 PLUS/S is ready to type

on page 0 immediately after power is applied. To view or edit another page push the GO key, a page number (one or two digits), and then the RETURN or ENTER key (they are identical in function). You are now ready to type.

You may change rapidly from one page to the next by pushing GO, then +, or GO, then -.

If the optional extra memory is installed there are four banks of 16 pages, labeled A,B,C, and D. To move between banks of memory, push GO, then A,B,C, or D, then a page number, then RETURN.

3.5 HOW TO CLEAR THE SCREEN OF TEXT

Push the HOME-ERASE key by itself (upper right of keyboard) to send the cursor to the HOME position (top row, first character position). (The cursor is a white rectangle which appears only on the Preview monitor.)

To erase the screen of text, hold the ALT key down and push the HOME-ERASE key.

3.6 HOW TO MAKE A SOLID BACKGROUND

To make the background a solid color push COLOR SELECT, then a number from 1 to 8, then B (for BACKGROUND)

To superimpose characters over picture video use the color Ø: COLOR SELECT, Ø, B.

3.7 HOW TO ENTER TEXT

Text is always entered at the cursor position. The cursor is a white rectangle that appears on the preview page (If multiple cursors appear, hold the ALT key down and push the HOME-ERASE key to clear the screen.)

Choose the color of characters to be typed by pushing the COLOR SELECT key, then a number from 0 to 8, then a C. Choose flashing ON or OFF by pushing the FLASH key on the left.

Type any letter or number key and the character will appear at the cursor position. The cursor will then move one space to the right. The left margin at the screen is preset at the factory, but the right margin is flexible and dependent on the number and mix of character sizes used. A maximum of 32 characters may be displayed on any line.

To end a line of text type a RETURN (or ENTER, they are the same function); the cursor will move to the beginning of the next line down. The up-down-left-right cursor controls will also move the cursor around on a page. BACKSPACE will move the cursor one space back. To erase a large part of a line all at once, put the cursor on the first character to be erased and push the DELETE key: the rest of the line will be erased and the cursor will move to the next line.

Once text is typed it is in memory automatically; no other operation is required to save it. The battery will hold the text indefinitely while power is off (except on page 0 which is always re-written at power-up).

3.8 HOW TO CHANGE COLORS

There are 8 color choices in the K20 PLUS/S. (see the keyboard overlay or section 1.3.2 for a list of colors.) The K12 has only transparent, white, and black.

The background of the screen can be made into a solid color by pushing COLOR SELECT, then a number from 1 to 8, then a B.

The characters on a line may be colored by pushing COLOR SELECT, then a number from 0 to 8 then a C.

3.9 HOW TO FLASH CHARACTERS

To type flashing characters, push the FLASH key, then type as usual. To make a character flash which has already been typed: put the cursor over it, push the FLASH key and retype the character.

3.10 HOW TO CHANGE THE FLASH RATE

To change the flash rate, push the FLASH RATE key, then a two-digit number from ØØ to 99, then return. All characters programmed to flash will flash at the new rate.

3.11 HOW TO ROLL A PAGE

To Roll a single page, first be sure the page following it is blank. Then GO to the page , push the ROLL key on the left side of the keyboard, then push the GO key when you are ready to ROLL the page. When the page is rolled all the way through, push the ESCape key once. If you wish to repeat the page, just push GO. To return to full screen, push ESCape key a second time. A roll can be stopped abruptly at any time by pushing the ESCape key twice.

To adjust the roll speed, push a number key from 1 to 4 while the page is rolling. The zero key will cause the roll to pause until another number key is pushed, or until the ESCape key is pushed.

To roll several pages, GO to the first one and push ROLL, then GO when you are ready. The pages will roll through, in numerical order, up to and including page sixteen, then beginning again at the page you started on. To stop the roll at any time, push ESCape once. To begin again, just push GO. To stop roll abruptly, push the ESCape key twice.

The K20 PLUS/S roll will continue indefinitely until the ESCape key is pushed.

3.12 HOW TO USE THE TITLE POSITIONER

Any one line on a page may be displayed by itself on the top, center, or bottom of the screen. Put the cursor on the line to be displayed,

then push TITLE, then a T for top or a C for center if desired, then GO: the title will appear at the top or center if you pushed T or C, or at the bottom if you did not specify a location.

To insert the next lower line of the page into the title window, push the cursor down key. To insert the next higher line of the page into the title window, push the cursor up key. You may move through all the lines on a page to insert titles from the next higher or lower page.

3.13 HOW TO USE THE ALTERNATE FONT

The K20 PLUS/S is equipped with an alternate character set in its standard configuration; a complete upper case font called Eurobold.

The keyboard must be shifted into another mode to gain access to the other character set. To shift the keyboard into the alternate mode push the ALT FONT key - all letter keys will then type characters in the alternate character set. To shift back into the regular mode just push ALT FONT again.

Sometimes you would like to shift into the alternate mode to select just one letter from the alternate set. In this case push CONTROL Z. The next letter key you press will type a character from the alternate set, but then the keyboard will revert to normal mode and the following key you type will be from the regular font.

3.14 HOW TO COPY FROM ANOTHER PAGE

Sometimes a series of pages will have nearly identical text. You can avoid retyping text or re-entering colors by copying from another page and making modifications to the copy.

To copy from a previous page go to the new page, push COPY PAGE, then the old page number, then RETURN. The text may be erased in the usual way (ALT + ERASE) and the color background will remain.

SECTION 4. MAINTENANCE

NOTE: *Maintenance of the K20 PLUS/S , except for changing the memory save battery, should be performed by qualified service people only. Maintenance of the power pack unit exposes the maintenance person to risk of injury by contact with dangerous high voltage.*

4.1 INTRODUCTION

The only routine maintenance the K20 PLUS/S requires is to change its memory save battery located in the K20 PLUS/S keyboard unit. The only other maintenance that may be attempted without training is the alignment of the K20 PLUS/S 's video processor.

4.2 HOW TO REMOVE THE K20 PLUS/S COVER

The keyboard unit has a removable cover: with power off remove the two panhead screws on the rear of the unit at the outside edges, and the three flathead screws under the front lip. Lift the cover up at the rear just until it clears the BNC panel, then slide it forward and off. The K20 PLUS/S may be operated with the cover off if care is exercised to prevent anything coming in contact with the electronic circuitry.

4.3 HOW TO CHANGE THE BATTERY

A small, flat, 3 volt battery, (Duracell DL2032 or equivalent) is located behind the keyboard, on the p.c. card on the left side of the K20 PLUS/S . It should be changed once a year, or sooner if the memory seems to be changing when power is off. Do not attempt to charge the battery. Change the battery by prying up the metal clip in the center of the holder just enough to slip the old battery out. Insert the new battery the same way; be sure to have the + side of the battery up.

If the battery seems to need changing more often than every three months a bad IC or leaky capacitor may be at fault. Consult the factory for advice.

4.4 HOW TO ALIGN THE VIDEO

Due to changes in the video driving the K20 PLUS/S or to aging of components, some occasional adjustments may have to be made to the K20 PLUS/S 's video processor. No adjustments can be properly made without the following equipment, but an approximate setting can often be found by observation:

Equipment required:

Standard NTSC (PAL) or Y/C color bar generator
NTSC (PAL) or Y/C Waveform Monitor
NTSC (PAL) or Y/C Vectorscope

A complete alignment requires the following steps:

POWER UP PROCEDURE: Connect power, no video input (use special tool provided)

1. Adjust free-running sync C139 for H = 15.75 KHz.
2. Adjust free-running subcarrier C122 to lock burst on vectorscope.

Apply color bars to composite video input, select comp.

3. Check for genlock

ALIGNMENT PROCEDURE. Connect power, color bars to composite video input. On logic board

1. Check for positive 70 nsec pulse once per scan line at U50/5; adjust R82 if necessary

Set display off using PROGR ON key

2. Set H phase using rear panel adjustment R36 (align internal, external blanking signals).
3. Check subcarrier lock, adjust C122 if required.
4. Adjust video gain for 1:1 color bars using R55, C112, R23.

5. Adjust pedestal for blanking level alignment using R60.
6. Adjust sync level using R92.
7. Set subcarrier phase using rear panel adjustment R28.
8. Remove color bars. Recheck free-run sync and subcarrier C139, C122. Connect color bars.
9. Recheck H phase and SC phase R36, R28.
10. Repeat steps 5, 6, 7, and 8.

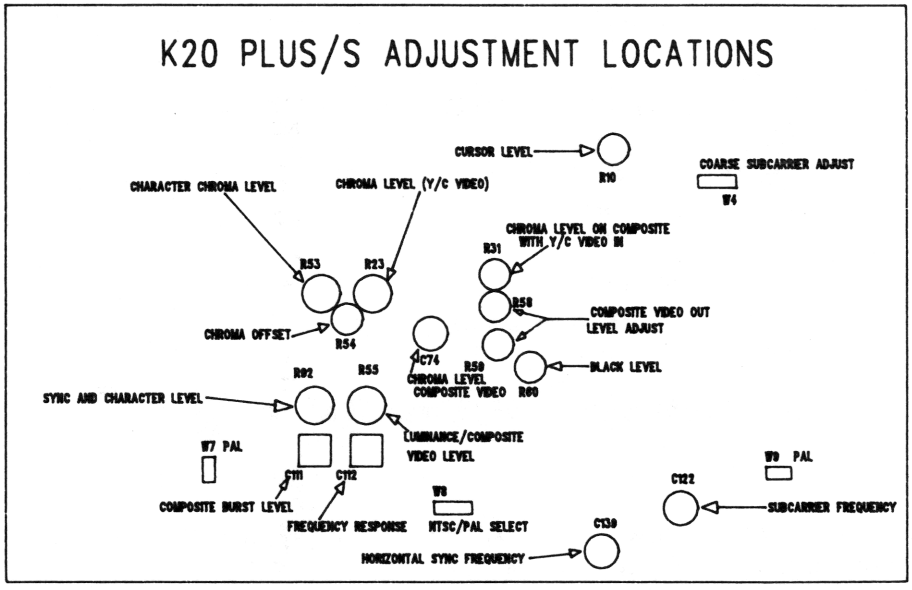


Figure 4.1: Internal Adjustments

4.5 JUMPER OPTIONS

When using the K20 PLUS/S with an external keyer there is sometimes a large color phase difference between system subcarrier and the K20 PLUS/S 's PROGRAM output. The rear-panel subcarrier control R28 provides approximately 180° of adjustment. If additional range is required, a jumper labeled W4 is located above U20 on the right-hand side of the PC board. Usually the jumper is connected from the center hole to the right hole at W4; change it to connect the center and left holes to get the other 180°.

Other jumpers on the video board are used to change between NTSC and PAL operation. Refer to the schematic for their location and consult the factory if you wish to change from one to the other.

SECTION 5. THEORY OF OPERATION

5.1 INTRODUCTION

It is strongly recommended that all repairs and modifications to the Knox K20 PLUS/S be performed at the factory or by factory-trained persons. However, this section contains the information required by technicians attempting to undertake repairs or modifications when factory assistance is not available. The information is confined to an overview, and assumes a knowledge of video and logic circuitry and familiarity with all the electronic components used in the K20 PLUS/S .

5.2 LOGIC SECTION

Microprocessor: The K20 PLUS/S 's data entry, editing, and video refresh functions are controlled by a Z80B microprocessor (U49) running at 6 MHZ (Y3). The operating system is a machine code program compiled from a C language source; it resides in a 16K PROM (U23). The RAM for the Z80 is an 8K byte wide chip (U34) with battery backup circuitry (R84, R85, U53, B1, CR3, CR5). Memory addresses are decoded in U30 and U31; port addresses are decoded in U36. The KILLER port is further decoded at U29 to make a status display mask (STATUS), a program on-off function (DISPLAY), and 2 memory expansion signals (K2 and K3). A long-period square wave (FLASHGATE) is developed from FLASHER at U52.

The Z80 is interrupt driven. The non-maskable interrupt is connected to vertical sync (IVERT) from the video board. The maskable interrupt is a horizontal sync pulse of 70 nsec delayed at U50.

Keyboard Entry: The keyboard is a self-driven microprocessor-controlled fully-encoded ASCII keyboard which sends serial ASCII data at 9600 baud, in RS232 configuration at TTL levels. The baud clock is set by crystal Y1 at the 6403 UAR/T (U28). Its parallel output is connected to the data bus via a tristate buffer included in the UAR/T, and its strobe (KSTRO) is sampled each field during the vertical interval at buffer U8. The odd-even field information from the sync processor is also sampled at this port (POLL).

Page Memory: The expandable page memory of the K20 PLUS/S is made up of 2 RAM chips at U3, U9, which can be 8K 6264's or 32K 62256's. The memory addressing for both editing and refresh is loaded through latch-counters U7, U1, U2, U6. During screen refresh a starting address is loaded at horizontal interrupt, after which the counters advance in binary. Each character is a two-byte word which is accessible to the Z80 through U24, U25; the top byte of the two byte word determines which character in the library is to be displayed, while the lower byte determines its color, whether it has an EDGE, or should be FLASHING, and whether the cursor is located at that memory position.

The ASCII information is passed to two large PROM's (U26, U40) which have the character dot structure and size parameters, respectively. The Z80 latches the correct scan line address during the H interrupt at U39.

The dot pattern is loaded from U26 into a shift register (U27) and shifted out for further processing. A visible cursor is added at the cursor memory location (U16, U41). The size PROM (U40) yields height information (SCANGATE) (U15), and width (1/2, 3/4) data which feeds a counter and PROM combination (U14, U42) which determines when the address should advance to the next character.

The clock which drives the bitstream is developed in the video section (SCLOCK) and counted down to form the horizontal margin (U17, U18, U31), and develops LOAD, the quarter-character marker, and VCLOCK (U13).

Data for the character color is latched and delayed at U12 and multiplexed with background color at U11. At each V interrupt a background color is latched into U4. Since a maximum of 32 characters may appear on any one line, an end-of-line signal is developed (U10, U41) to mask the rest of the line (U16).

5.3 VIDEO SECTION

Sync Generator: NTSC or PAL sync is developed by an Hitachi 44007 generator (U55) and buffer (U54). It is driven by a 4 MHz clock derived from SCLOCK (U57). SCLOCK is developed in a VCO: in the

absence of external sync a single shot U58 keeps the control voltage at 50% (U48, R98, C126). When external video is applied, the sync is stripped from it (U35, Q21) and a 90° out-of-phase horizontal signal is developed (U21) and combined with a similar signal from internal sync (U58, U21). The phase is fine-tuned at R36 (U21). Field ID is determined at Q26 and U44.

Subcarrier: A PLL (U47) develops a continuous 3.58 (or 4.43) MHz signal from crystal Y2. A sample of external video is applied at pin 1 of the PLL and a burst gate marker applied to pin 9. For PAL an alternating line signal is developed at Q28, U58, Q29. The subcarrier is coupled to single-shots (U20) where it is delayed (R28), re-squared (R41, C56), and filtered into a sine wave (L2, C57, R43, R15).

Encoder: The multiplexed color data, edging, and program control are presented to an interpreter PROM (U32) which translates the data into 8-level RGB. An encoder pair (U33, U45) take the RGB, sync, and subcarrier data and develop a composite video signal at Q13. The PROM also senses the TRANSPARENT color and operates switches to select between generator video and external video (U34, U19). The K12 does not encode color.

Latches-mixer: Incoming video is clamped Q19, L3 and buffered (Q20, Q17). Internal video is buffered (Q12, Q16), clamped (Q18, L1) and buffered again (Q17). The signals are mixed using the TRANSPARENT switch at switching amplifiers (U19, U34), and then amplified and buffered to form a 75 ohm output (Q8, Q7). A separate PREVIEW output is developed at Q9, Q10, Q11.

5.4 POWER UNIT

The K20 PLUS/S gets +5, +12, and -12v DC power from its power pack, an AC-to-DC switching power supply enclosed in a separate rectangular enclosure. An LED indicator glows red when the supply is functioning. The supply should not be operated without the K20 PLUS/S connected to it.

5.5 SIGNAL LIST

Name	Type	Purpose
RESET	TTL LEVEL	to reset Z80
IHORZ	TTL PULSE	internal horizontal drive
IVERT	TTL PULSE	internal vertical drive
MREQ	TTL PULSE	Z80 memory request
IORQ	TTL PULSE	Z80 I/O request
RD	TTL PULSE	Z80 read
WRB	TTL PULSE	buffered Z80 write
CPUROM	TTL PULSE	Z80 program memory
CPURAM	TTL PULSE	Z80 scratch pad memory
KEYBOARD	TTL PULSE	Z80 keyboard port
SERIAL IN	TTL PULSE	serial data from keyboard
KSTRO	TTL PULSE	keyboard strobe
POLL	TTL PULSE	Z80 vertical interrupt polling port
FIELD	TTL PULSE	odd-even field
ASCIIM	TTL PULSE	high byte page memory decode
COLORM	TTL PULSE	low byte page memory decode
BACKGR	TTL PULSE	left margin decode
MMAP	TTL PULSE	starting address decode
SCANNER	TTL PULSE	scan line decode
KILLER	TTL PULSE	display port decode
SPARE	TTL PULSE	spare
FLASHER	TTL PULSE	flash rate decode
FLASHGATE	TTL SQ.WAVE	flashgate
DISPLAY	TTL LEVEL	low for display on
K2, K3	TTL LEVEL	extra memory address bits
NEXT	TTL PULSE	advance character
MARGIN	TTL PULSE	left margin
LOAD	TTL PULSE	1/4 character marker
3/4	TTL LEVEL	high for 3/4 size characters
1/2	TTL LEVEL	high for 1/2 size characters
CLATCH	TTL PULSE	latch character color
DONTLOAD	TTL LEVEL	characters off
SCLOCK	TTL CLOCK	system clock
DCLOCK	TTL CLOCK	buffered clock
VCLOCK	TTL CLOCK	delayed DCLOCK
IBLANK	TTL PULSE	internal blanking
CURS	TTL LEVEL	cursor bit on
FLASH	TTL LEVEL	flash bit on
COL0-4	TTL LEVEL	5-bit color word
EOL	TTL PULSE	end-of-line
BITS	TTL PULSE	serial character bitstream

Name	Type	Purpose
SCANGATE	TTL PULSE	character top and bottommargins
TOPSCAN	TTL LEVEL	character scan blanking
DATA	TTL PULSE	processed character bitstream
TRANS	TTL LEVEL	transparent color decode
ISYNC	TTL PULSE	internal sync
IBG	TTL PULSE	internal burst gate
BG	TTL PULSE	unbuffered burst gate
PAL	TTL PULSE	alternate scan lines (PAL)
SC	TTL SQUARE WAVE	subcarrier

5.6 MEMORY MAP AND PORT ADDRESSES

K20 PLUS/S Memory Allocation:

E000-FFFF	VIRTUAL MEMORY
C000-DFFF	BACKGROUND
A000-BFFF	CPURAM
8000-9FFF	COLOR BYTE
6000-7FFF	ASCII BYTE
0000-5FFF	CPUROM

K20 PLUS/S Port Addresses:

00	KEYBOARD DATA
08	POLL FOR STROBES, FIELD
0C	SCAN LINE LATCH
10	DISPLAY KILLER AND MEMORY EXPANSION
14	SPARE WITH LATCH
18	SPARE
1C	FLASH MARKER

SECTION 6. PARTS LIST

6.1 INTRODUCTION

This section provides a list of all electrical parts contained in the K20 PLUS/S character generators. Table 6-1 lists the components in the P. C. board and 6-2 the power supply and chassis parts.

TABLE 6-1 LOGIC BOARD

Qty	Part No.	Description	Designation
1	13400	K20 Logic PC Assembly	-
1	30430	K20 PROM - Programmed Part 59600	-
1	304	K12 Mono Prom	-
1	30450	K20 Color Prom	-
1	30600	K20 Program - NTSC Programmed Part 59772	-
1	30610	K20 Character Set I Programmed Part 59772	-
1	30620	K20 Attribute Set I Programmed Part 59790	-
3	50131	74HCT04	U10, 30, 45
1	50421	74HCT08	U13
1	50481	74HCT10	U15
1	50501	74HCT11	U22
2	50632	74HC14	U37, 53
1	50790	74HCT21	U16
1	50971	74HC32	U43
1	50990	74HCT32	U5
4	51461	74HCT74	U31, 41 44, 52
1	51641	74HCT86	U48
1	52070	74LS629	U57
1	52180	74LS138	U51
1	52181	74HCT138	U36

Qty	Part No.	Description	Designation
4	52441	74HCT161	U14, 17, 18, 56
1	52521	74HCT166	U27
1	52810	74LS193	U7
4	52811	74HCT193	U1, 2, 6, 29
3	53010	74LS221	U20, 21, 58
1	53013	74HCT221	U50
3	53061	74HCT245	U8, 24, 25
1	53611	74HCT367	U54
1	53621	74HCT373	U11
3	53631	74HCT374	U4, 12, 39
1	58800	LM320T-5/MC7905CT	VR3
1	58880	LM360N	U35
1	58930	LM1886	U33
1	58940	LM1889	U46
1	59060	INTERSIL#IM6403IJL	U28
1	59641	Zilog Z80B Cpu 6 MHz	U49
2	59700	MC1445	U19, 34
1	59680	Linear IC Subcarrier Generator	U47
1	59820	HD44007A Hitachi	U55
3	59840	HM6264	U3, 9, 38
1	70410	Diode 1N749A	CR5
1	70050	Diode Signal 1N914	CR5
2	70080	Diode 1N4001	CR2, 3
1	70210	Diode 1N4372	CR4
18	75150	2N513	Q1, 4, 5, 7, 9, 13, 15 17, 20, 22-25, 28, 29
5	75160	2N5139	Q8, 18, 19, 21, 26
5	75340	FET 2N4857	Q2, 3, 6, 14, 27
1	80080	Resistor 47 ohm 1/4 5%	R73
6	80120	Resistor 75 ohm 1/4W 5%	R5, 11, 14, 20, 25, 33

Qty	Part No.	Description	Designation
1	80150	Resistor 100 ohm 1/4W 5%	R15
4	80170	Resistor 150 ohm 1/4W 5%	R4, 6, 26, 34
1	80350	Resistor 390 ohm 1/4W 5%	R56
1	80420	Resistor 680 ohm 1/4W 5%	R66
1	80450	Resistor 450 ohm 1/4W 5%	R29
13	80500	Resistor 1.0K 1/4W 5%	R12, 27, 30, 32, 37, 43, 74, 77, 89, 90, 98, 106, 107
1	80600	Resistor 1.5K 1/4W 5%	R78
2	80680	Resistor 2K 1/4W 5%	R7, 69
3	80700	Resistor 2.2K 1/4W 5%	R50, 75, 87
3	80720	Resistor 2.4K 1/4W 5%	R41, 93, 95
1	80730	Resistor 2.7K 1/4W 5%	R27
1	80750	Resistor 3.9K 1/4W 5%	R70
2	80790	Resistor 4.3K 1/4W 5%	R57, 96
4	80800	Resistor 4.7K 1/4W 5%	R49, 67, 68, 94
2	80900	Resistor 6.8K 1/4W 5%	R24, 40
1	81000	Resistor 8.2K 1/4W 5%	R48
2	81100	Resistor 12.K 1/4W 5%	R83, 99
1	81410	Resistor 47.K 1/4W 5%	R63
1	81150	Resistor 15K 1/4W 5%	R51
2	81350	Resistor 33K 1/4W 5%	R13, 35
6	81500	Resistor 100K 1/4W 5%	R3, 9, 21, 52, 81, 91
1	81520	Resistor 220K 1/4W 5%	R8
3	81700	Resistor 1M 1/4W 5%	R76, 86, 105
1	81550	Resistor 330K 1/4W 5%	R72
1	87320	Trimpot 500 ohms	R54
3	87330	Trimpot 1K	R10, 58, 60
2	87372	20K Trimpot	R28, 36
1	87400	Trimpot 20K	R82

Qty	Part No.	Description	Designation
1	89999	Selected Value Resistor	R85
2	90130	Capacitor 2-10 PF	C111, C112
3	90160	Capacitor 5-25 PF NPO Variable	C76, 122, 139
1	90190	Capacitor 10 PFD NPO	C52
5	90220	Capacitor 33 PF Stable	C70, 110, 121, 125, 132
1	90360	Capacitor 68PF Stable	C131
2	90370	Capacitor 82 PF Stable	C29, C57
4	90410	Capacitor 100 PF NPO	C50, 56, 83, 115
4	90440	Capacitor 100 PF Stable	C71, 72, 118, 137
1	90450	Capacitor 150 PF Stable	C100
2	90540	Capacitor 220 PF Stable	C79, 86
1	90570	Capacitor 330 PF	C88
1	90650	Capacitor 470PF	C107
1	90700	Capacitor 680 PF GP	C134
4	90850	Capacitor 0.001 UFD Stable	C54, 73, 95, 128
4	91110	Capacitor 0.002 UFD Stable	C43, 97
3	91250	Capacitor 0.0047 UFD Stable	C21, 58, 140
8	91340	Capacitor 0.01 UF Stable	C18, 85, 89, 109, 116, 117, 119, 120
1	91500	Capacitor 0.002 UFD Stable	C94
54	92000	Capacitor 0.1 UFD 50V GP	C1-10, 13, 17, 22-24, 26-28, 30-35, 38, 41, 55, 59-67, 69, 75, 82, 91-93, 96, 98, 99, 101, 102, 104-106, 108, 124, 126, 129
19	92300	Capacitor 1.0 UFD 50V	C12, 15, 45-47, 51, 53, 68, 77, 78, 80, 81, 90, 103, 113, 123, 133, 136, 138
1	92600	Capacitor, 2.2 UF 16V	C114
2	93020	Capacitor, 10 UF 16V	C37, 87
3	93450	Capacitor 100 UFD 16V	C11, 13, 46

Qty	Part No.	Description	Designation
3	93550	Capacitor 220 UFD 16V	C16, 127, 130
1	93650	Capacitor 470UF 16V	C25
4	93660	Capacitor 680 UF 16V	C19, 20, 42, 48
1	100310	Inductor, 22 UH	L2
1	100350	Inductor, 12 UH	L1
2	100360	Inductor 100 MH	L3, 5
1	130670	Crystal 2.4576 MHz	Y1
1	130710	Crystal 3.58 MHz	Y2
1	130770	Crystal 6 MHz	Y3
1	140894	Battery Holder BH906	BH1
1	140895	Duracell Battery DL2032	B1
1	160200R5	PC Board	-

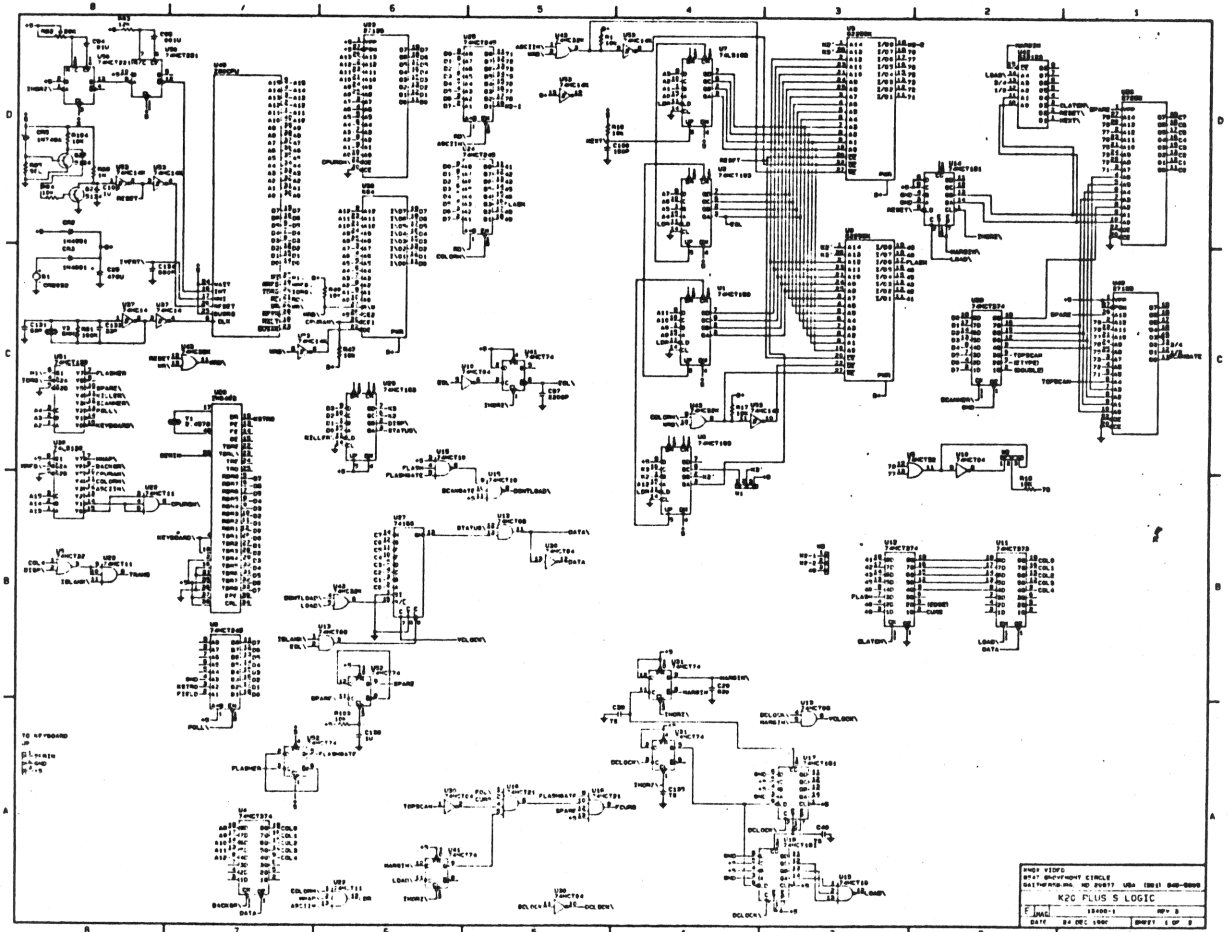
TABLE 6-2: POWER AND CHASSIS PARTS

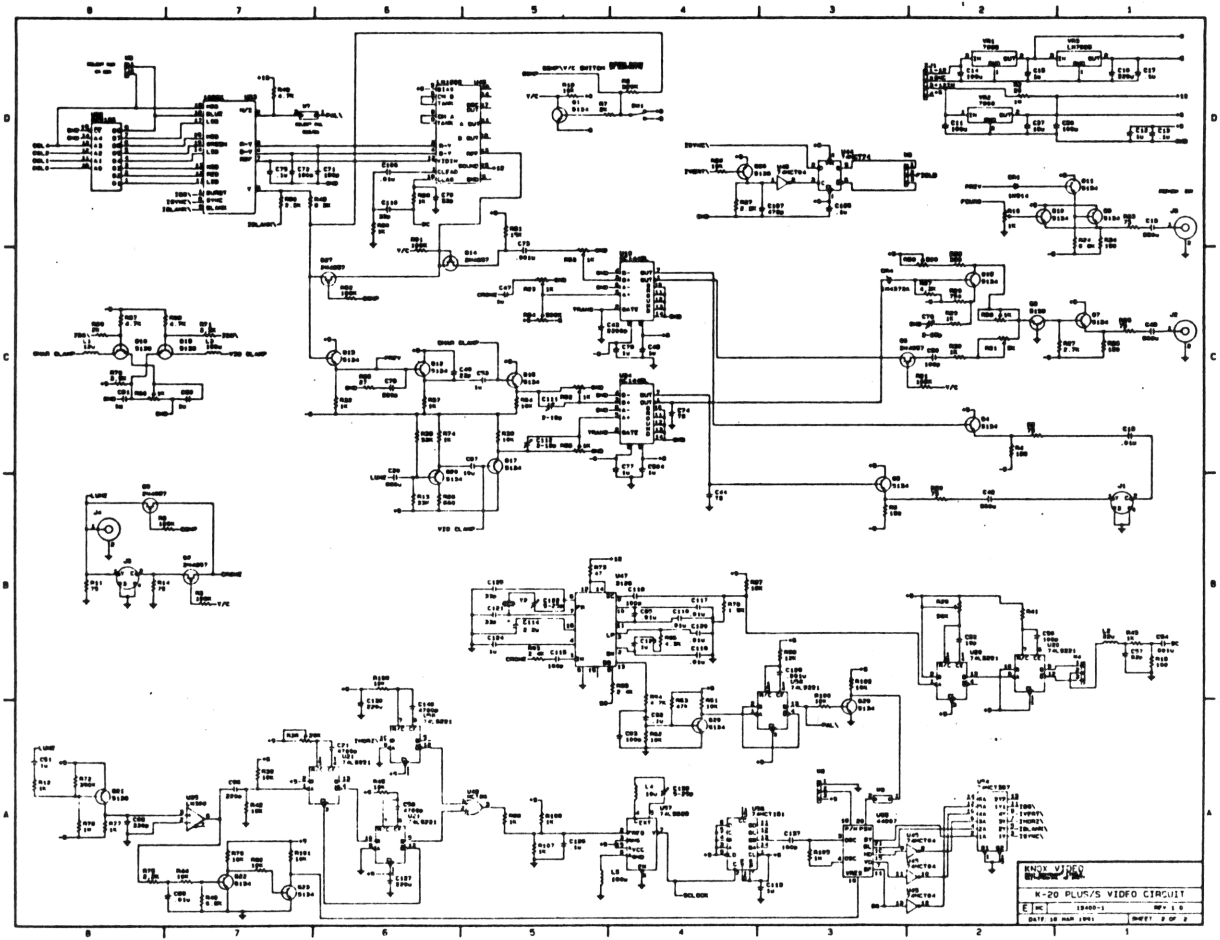
QUANTITY	KNOX PART #	DESCRIPTION
1	20033	Cable, Keyboard
1	20034	Cable Assy, Power
1	110273	Switch, Power
1	120020	LED, 5 V
3	140230	Connector, BNC
1	170020	Power Cord
1	190100	Power Supply Micro 40
1	190270	Keyboard Micro-Switch 84ST13-26
2	250200	Bushing, Power
1	251060	Overlay, Keyboard
1	275682	Chassis, Keyboard
1	275687	Chassis, Power
1	275688	Cover, Power
1	275683	Cover, Keyboard
1	275696	Plate, BNC

SECTION 7. DIAGRAMS

This section contains the following drawings:

1. K20 PLUS/S Logic Schematic-Sheet 1
2. K20 PLUS/S Logic Schematic-Sheet 2
3. K20 PLUS/S PC Assembly


ANDY VIDEO
K20 PLUS S LOGIC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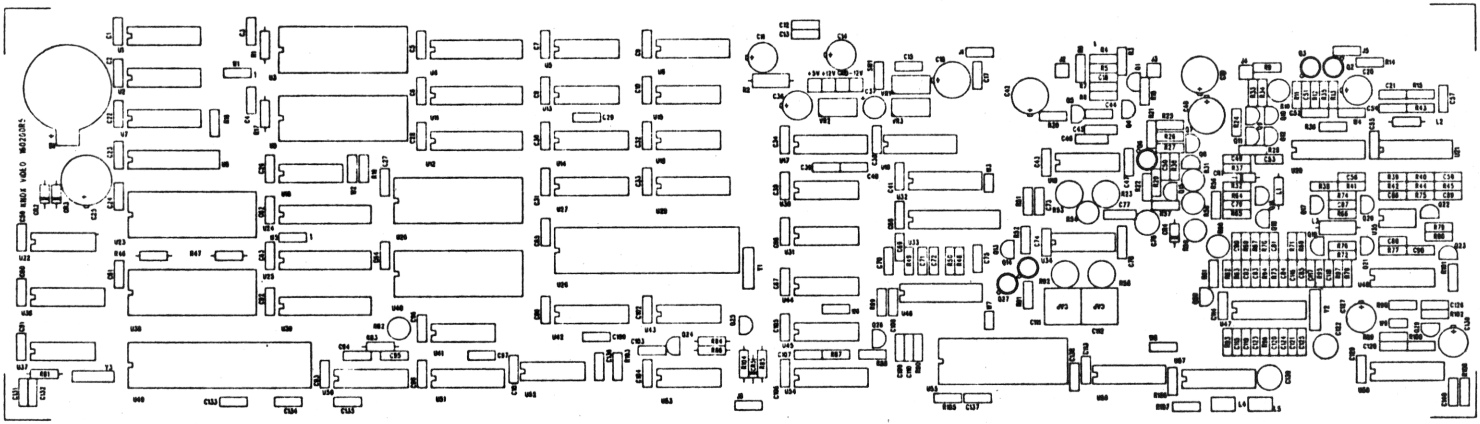
K-20 PLUS/S VIDEO CIRCUIT
DATE 18 MAR 1991
SHEET 2 OF 2



SILKSCREEN COMPONENT SIDE
KNOX VIDEO K-20 CARD
ALL ARTWORK VIEWED FROM COMPONENT SIDE
EMDS

160200R5 job - Thu Oct 3 16:15:37 1991